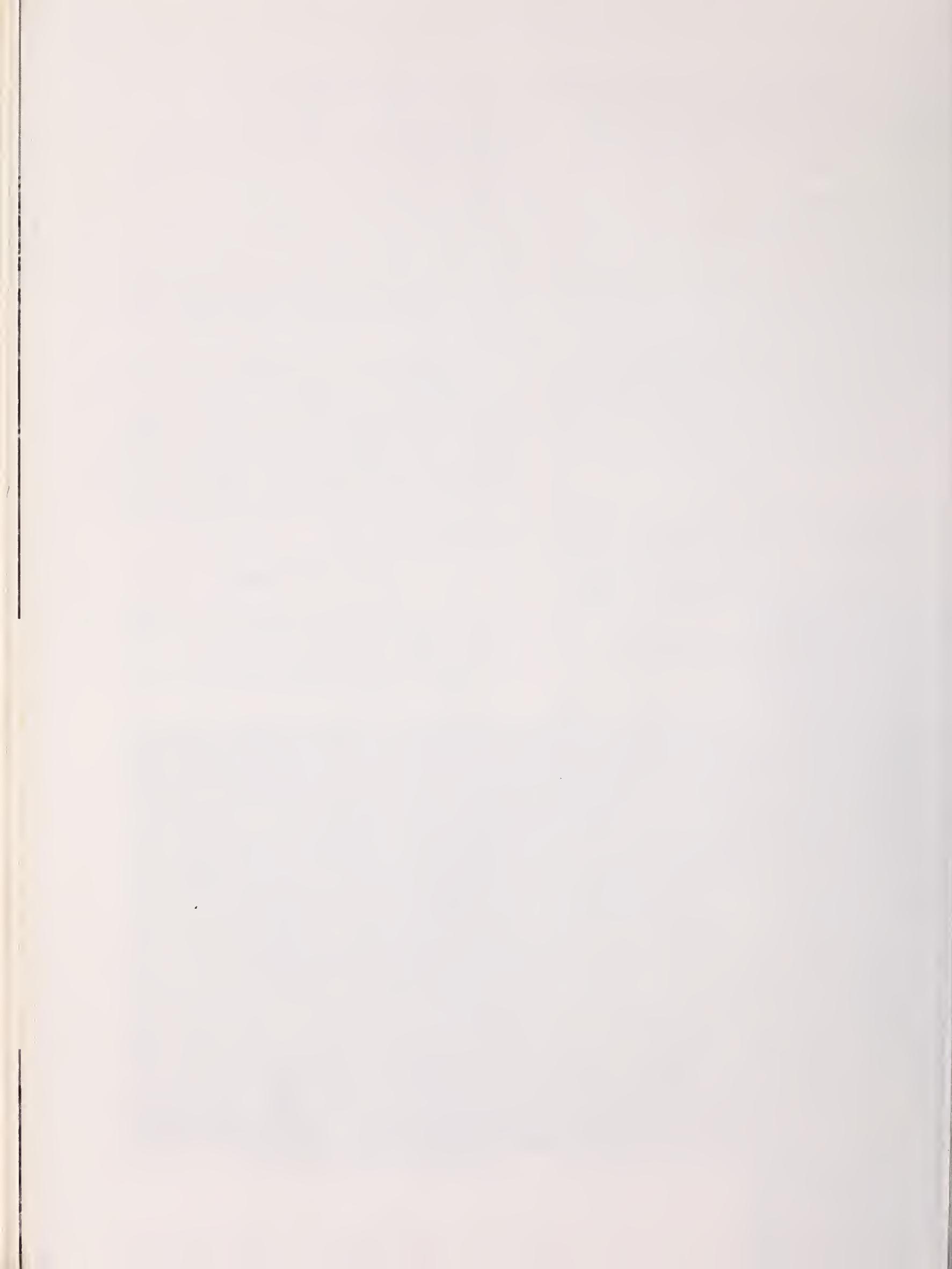


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Food Habits of Coyotes in a Semidesert Grass-Shrub Habitat

Henry L. Short¹

Coyotes (*Canis latrans*) feeding in a semidesert grass-shrub habitat consume a variety of foodstuffs throughout the year. The relative incidence of several plant and animal items in coyote scats did not seem to vary throughout the year. The incidence of other items, like pocketmice (*Perognathus* spp.) in late winter and spring, bird eggs in early summer, and the fruits of prickly pear (*Opuntia engelmannii*) and mesquite (*Prosopis juliflora*) in late summer, varied in an interpretable manner between months.

Keywords: Coyotes, *Canis latrans*, food habits, scat analysis, Sonoran Desert.

Predators in cold climates frequently rely on a single prey species as their major food source (Emlen 1973) while predators in warmer climates consume a variety of foods (Murie 1951, Sperry 1941, Truett and Day 1966). The complex food habits of coyotes (*Canis latrans*) in a semidesert grass-shrub habitat in the Southwest is described in this study conducted on the Santa Rita Experimental Range (SRER), Pima County, Arizona.

Study Area

The 20,000-ha Santa Rita Experimental Range extends northward toward Tucson from the foothills of the Santa Rita Mountains.

¹Formerly Principal Research Wildlife Biologist, Rocky Mountain Forest and Range Experiment Station, USDA Forest Service. Central headquarters located at Fort Collins, Colo., in cooperation with Colorado State University. Author was stationed at Forest Hydrology Laboratory, Tempe, Ariz., in cooperation with Arizona State University. Author is Terrestrial Ecologist, Western Energy and Land Use Team, U.S. Fish and Wildlife Service, Fort Collins, Colo.

Average annual rainfall varies from about 25 cm at 885 m to about 50 cm at 1310 m (Martin and Reynolds 1973). Velvet mesquite (*Prosopis juliflora*), cholla cactus (*Opuntia* spp.) and prickly pear (*O. engelmannii*) are abundant throughout the range. Other shrubs locally common include burroweed (*Haplopappus tenuisectus*), acacias (*Acacia* spp.), mimosa (*Mimosa* spp.), false mesquite (*Calliandra eriophylla*), and ocotillo (*Fouquieria splendens*). Several threeawns (*Aristida* spp.), gramas (*Bouteloua* spp.), and other grasses are present and generally increase in abundance as elevation and precipitation increase.

Common mammals on the Santa Rita Experimental Range include the black-tailed jack rabbit (*Lepus californicus*), antelope jack rabbit (*L. alleni*), desert cottontail (*Sylvilagus audubonii*), Harris' antelope squirrel (*Ammospermophilus harrisii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), Botta's pocket gopher (*Thomomys bottae*), desert pocket mouse (*Perognathus penicillatus*), Ord's kangaroo rat (*Dipodomys ordii*), Merriam's

kangaroo rat (*D. merriami*), western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus maniculatus*), cactus mouse (*P. eremicus*), southern grasshopper mouse (*Onychomys torridus*), white-throated woodrat (*Neotoma albicula*), gray fox (*Urocyon cinereoargenteus*), ringtail (*Bassaris astutus*), striped skunk (*Mephitis mephitis*), collared peccary (*Dicotyles tajacu*), white-tailed deer (*Odocoileus virginianus*), and mule deer (*O. hemionus*).

Common birds include Gambel's quail (*Lophortyx gambelii*), road-runner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), ladder-backed woodpecker (*Picoides scalaris*), black phoebe (*Sayornis nigricans*), Say's phoebe (*Sayornis saya*), ash-throated flycatcher (*Myiarchus cinerascens*), cactus wren (*Campylorhynchus brunneicapillus*), rock wren (*Salpinctes obsoletus*), mockingbird (*Mimus polyglottos*), phainopepla (*Phainopepla nitens*), yellow-rumped warbler (*Dendroica coronata*), cardinal (*Cardinalis cardinalis*), house finch (*Carpodacus mexicanus*), brown towhee (*Pipilo fuscus*), white-crowned sparrow (*Zonotrichia leucophrys*), and black-throated sparrow (*Amphispiza bilineata*) (Martin and Reynolds 1973).

Common reptiles include Clark's spiny lizard (*Sceloporus clarkii*), eastern fence lizard (*S. undulatus*), short-horned lizard (*Phrynosoma douglassi*), gila monster (*Heloderma suspectum*), southern whiptail (*Cnemidophorus tigris*), Sonora whipsnake (*Masticophis bilineatus*), striped whipsnake (*M. taeniatus*), gopher snake (*Pituophis melanoleucus*), black-tailed rattle-snake (*Crotalus molossus*), and western rattle-snake (*C. viridis*) (Martin and Reynolds 1973).

Food sources potentially available to coyotes on or near the Santa Rita Experimental Range also include a large cattle feedlot operation and an extensive pecan orchard along the bottomlands of the Santa Cruz River. Both the feedlot and the orchard are adjacent to the western edge of the SRER.

Methods

Coyote scats were collected from four standardized areas on the SRER. Each area included a fenced apron around a water source (stock tank, trick tank, or gallinaceous guzzler) and 5 to 7 km of little used dirt roads. The total

area searched for scats in each of the four collection sites ranged between 2.2 and 2.3 ha. The four permanent sampling areas were established and cleared of carnivore scats during mid-December 1974. Scats were collected about mid-month during each calendar month of 1975.

Individual coyote scats were placed in separate plastic bags which were labeled as to area and date of collection and were stored dry in a freezer. Each scat was later analyzed after being washed until soft enough to separate the contents. Items found in the scats, such as bones, teeth, feathers, hair, and seeds, were identified by comparison with known reference materials. Each coyote scat was treated as an individual observation and all the identifiable contents were recorded. Total number of scats collected, the total number of mammalian or plant remains per scat, and the incidence of particular food items in the scats collected each month are listed in table 1.

Results

A total of 960 coyote scats was collected during 1975 and subsequently analyzed from the four collection areas. Each coyote scat contained the remains of about 3.2 different food items. The number of different species of mammals found in each scat seemed less from August through October than during the other months, probably because of the increased consumption of fruits of mesquite and cactus during summer.

The incidence of the remains of jackrabbits, desert cottontails, kangaroo rats, mice, and woodrats in coyote scats did not seem to vary throughout the year. Pocket mice seemed to be consumed at relatively high rates during winter and early spring. Young pocket mice apparently forage above ground in early spring and are especially vulnerable to predation. Remains of Harris' antelope squirrels were more common in coyote scats collected during March, the month when young squirrels come above ground, than in scats from other months.

Hairs from the collared peccary and mule and white-tailed deer were present in a consistently small proportion of the collected coyote scats throughout the year. There was no evidence that fawns comprised a major food item for coyotes during July and August when parturition

Table 1. Remnants of food items identified in coyote scats from a semidesert grass-shrub habitat throughout the year.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
No. scats per month	118	103	132	117	111	45	12	42	68	84	66	62
No. different items/scat	3.65	2.84	2.92	3.25	3.41	3.67	3.67	3.05	1.81	2.96	3.29	3.71
No. different plant items/scat	1.97	1.34	1.23	1.53	1.52	1.64	1.42	2.05	1.25	1.88	1.89	1.90
No. different mammal spp./scat	1.24	1.27	1.48	1.36	1.32	1.27	1.83	0.64	0.40	0.64	1.04	1.13
Incidence of Food Items¹												
<i>Lepus</i> spp.	3	7	3	4	2	0	3	3	0	12	12	4
<i>Sylvilagus audubonii</i>	7	12	15	8	15	14	6	3	5	14	14	14
Total Leporidae	22	35	27	27	28	20	9	6	6	26	30	18
<i>Perognathus</i> spp.	21	12	19	26	18	15	6	3	1	1	3	0
<i>Dipodomys</i> spp.	11	4	7	5	0	0	6	3	12	4	2	0
<i>Peromyscus</i> spp.	1	4	5	10	3	2	6	1	0	0	1	0
<i>Neotoma</i> spp.	15	6	10	12	7	12	16	9	18	6	10	17
<i>Ammospermophilus</i> spp.	2	0	11	2	1	0	0	0	0	4	1	0
Total rodents	69	40	75	74	66	52	53	27	31	30	41	40
<i>Dicotyles tajacu</i>	2	11	2	3	1	0	6	0	0	1	2	2
<i>Odocoileus</i> spp.	4	14	14	7	10	19	13	20	0	0	5	17
Cattle	17	15	23	17	11	7	0	0	1	5	24	26
Total reptiles	5	4	2	5	4	6	0	12	0	2	0	3
Total insects	12	4	1	17	10	17	6	10	7	42	7	23
Total birds	15	8	11	13	16	18	9	9	2	13	18	24
Egg shells	0	1	1	1	26	14	3	6	0	1	0	0
<i>Opuntia engelmannii</i> fruit	2	0	4	5	0	2	0	43	99	66	18	4
Total cactus fruit	5	1	7	8	1	2	0	50	99	66	25	12
<i>Prosopis juliflora</i> (fruit)	9	2	5	5	1	2	3	65	3	53	16	16
<i>Prosopis juliflora</i> (leaves)	42	40	38	39	16	43	19	14	1	4	38	35
Grass	55	51	60	48	56	35	25	27	24	49	64	68
Pecans	14	8	5	11	7	17	3	0	0	0	1	10
Misc. vegetation	81	51	29	57	60	67	50	33	3	13	41	52
Misc. non-food items	6	1	0	3	3	2	0	2	0	0	2	8

¹Percent of coyote scats collected during each month that contain particular food items.

tion was occurring or that crippled collared peccary were consumed at high levels during the hunting season in February. Carrion from the nearby cattle feedlot operation seemed to be a major food item for coyotes during both autumn and winter. Feedlot carrion was not found in scats collected during the summer. Perhaps this difference was due to seasonal changes in feedlot operation, changes in the behavioral patterns of coyotes feeding at the feedlots so that they no longer frequented the collection areas, or seasonal changes in coyote food habits.

The incidence of remains of reptiles, insects, and birds in coyote scats was low and did not seem to vary between months. These food items may not be highly selected by coyotes at any time of the year. A variety of birds, including Gambel's quail, roadrunners, and black-throated sparrows, nest on or near the ground from mid-April through mid-June at the SRER and the incidence of egg shells in coyote scats seemed greater in May and June. The coyote may be efficient at finding and destroying bird

nests during the incubation season when the nests are highly vulnerable.

Many species of cacti in the Sonoran Desert bear fruit during the summer and coyotes feed on cactus fruits when they are ripe. Remains of prickly pear fruits were present in most of the coyote scats collected in September and October. One-half of the scats collected during August also contained the remains of prickly pear and other cactus fruits.

Velvet mesquite leaves were less abundant in coyote scats during September and October than during most of the other months. Beans of this spiny deciduous tree are palatable to wildlife and livestock and were apparently consumed at higher rates when ripe during August and October than during other months.

Remnants of grasses were frequently present in the coyote scats. The incidence of grass remains was less during summer months than during the other seasons. Grass may be eaten to provide bulk in the diet and is probably present

in the collected scats out of proportion to its actual value in the coyote's diet. Grass celluloses are of very limited digestibility to simple-stomached animals and consequently grasses eaten may be recovered more or less undigested.

Pecans are available on the ground in the large pecan orchard bordering the SRER during the winter due to storm action and commercial picking operations. Pecans are eaten by coyotes at apparently higher rates during January and remains were found during other months except those of late summer.

A variety of miscellaneous and unidentified vegetation, including fruits, herbage, and woody material, was present in many coyote scats throughout the year. The incidence of these miscellaneous plant materials did not seem to vary between months.

The occasional presence of pieces of leather thongs, plastic, gum wrappers, paper, cloth, and rubber bands in the coyote scats (miscellaneous non-food items in table 1) also emphasize the ubiquitous diet of coyotes on the SRER.

Discussion

Clearly the scat deposition on the four collection sites varied by months. That variability might have been due to one or more of the following seasonal changes in: (1) availability of water, (2) feedlot operations off the SRER which provided carrion as a food source, (3) coyote behavioral activity during summer, (4) numbers of coyotes on the SRER.

The analysis of scats provides some indication of coyote food habits. Obvious difficulties occur, however, in determining the quantity of prey from remains in scats. Are the macerated bones and fur in a single scat from one or several mice? Are the total remains from a single jackrabbit in one or in many scats? How wide an area will the scats containing remains from the same jackrabbit be deposited? Are

scats collected from sampling areas 3 to 5 km apart, as in the present study, likely to contain remnants from the same meal?

Scat analyses seem most useful when they are interpreted as indicating only the presence or absence of a particular food item in a systematically collected sample. For example, the data summarized in table 1 obviously indicate that a variety of foodstuffs, including plant materials, are eaten by coyotes on the SRER. Furthermore, some foods (like pocket mice in spring, bird eggs in May and June, and cactus fruits in August through October) seem to occur for interpretable reasons at different frequencies during different months. Additionally, there is no evidence in table 1 to suggest that javelina or deer were actively selected or major seasonal food items for coyotes on the SRER.

It is desirable to know how variations in food habits affect the seasonal deposition of scats on collection areas. Such information could be obtained with suitable feeding studies which would indicate the quantity and types of indigestible remnants from equal-sized meals of animal and vegetative materials of varying digestibility.

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